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REPORT BY THE COMPTROLLER  
GENERAL OF THE UNITED STATES

RESULTS OF PRODUCTION TESTING  
SHOULD BE CONSIDERED BEFORE  
INCREASING PATRIOT'S  
PRODUCTION

D I G E S T

Test results to date provide a basis for optimism about the Patriot air defense system's ultimate performance capabilities. Problems disclosed in earlier testing have kept the system in low-rate production for 3 years. For fiscal year 1983 the Congress approved the Department of Defense request to increase Patriot's production from the previous 9 fire units and 176 missiles to 12 fire units and 376 missiles. The Army plans to request additional production increases in its fiscal year 1984 budget. GAO believes that increases in the production rate above the present level of nine fire units should await the results of ongoing tests of initial production units, and the operational tests to follow, which are scheduled to be completed in August 1983. The operational tests will be conducted with production hardware and user personnel under combat conditions. Only prototype models have been tested previously.

Patriot succeeds Nike Hercules and Improved Hawk as the principal air defense missile against aircraft flying at medium and high altitudes. Patriot was approved for limited production in September 1980. At that time, it was still showing a low reliability and experiencing performance problems in certain combat environments. Contracts for the first 3 years' production were awarded as cost-plus incentive fee. This type of contract is normally used when a system's design is not yet stable, and the production risk is greatest. It is rare for a major weapon system production contract. Normally, when a system enters production, the design has been sufficiently stabilized and proven to permit awarding a fixed-price contract, under which the contractor would assume a share of the cost risk.



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Over the past 2-1/2 years, estimates of Patriot's program costs have nearly doubled. The current program cost estimate stands at more than \$11 billion. Some of the same factors which caused cost increases in the past are still present, making future cost increases likely. The contractor is behind schedule because of production problems. Also, the Army believes available funds may not be sufficient to adhere to the planned annual procurement schedule. This may require protracting the schedule and buying in less economical quantities. (See pp. 1 to 3.)

#### RELIABILITY HAS IMPROVED

Since the engineering development tests were completed in 1980, further testing has shown that the Army and the contractor have made good progress in resolving the Patriot's earlier reliability problems. The progress has been mainly in the hardware. The Army believes that reliability problems created by deficiencies in software have also been corrected. However, the modified software is still being tested. Other remaining problems are traceable to deficiencies in the maintenance software used to diagnose equipment failures. (See pp. 7 to 9.)

#### MAINTAINABILITY DIFFICULTY

Testing has shown that the diagnostic software used with the system's built-in test equipment has successfully identified faulty components only 50 to 60 percent of the time. As a result, the Army has decided to train additional personnel to maintain the system manually or with other test equipment that will not be built into the Patriot system. (Further improvements to the maintenance software are needed, however, before the system can be adequately supported in the field.) (See pp. 9 and 10.)

#### PERFORMANCE IN CERTAIN COMBAT ENVIRONMENTS

While the system's overall performance in the presence of certain combat environments has improved, its performance could still be degraded, in some cases more seriously than others. The Army is developing improvements to

increase the Patriot's ability in these environments. The improvements are to be tested in 1983. (See pp. 10 and 11.)

#### RECOMMENDATIONS TO THE SECRETARY OF DEFENSE

GAO recommends that the Secretary of Defense permit the fiscal year 1983 funds to be applied towards an increase in the production rate over the current level of nine fire units, only upon a showing in the production tests that deficiencies have been corrected.

GAO also recommends that the Secretary direct the Army to negotiate fixed-price contracts for future Patriot production under which the contractor would assume a share of the cost risk.

#### AGENCY COMMENTS

Defense officials said that they will provide the Secretary of Defense with the results of the production testing before the fiscal year 1984 production decision is due next fall. They do not agree that the results should influence the fiscal year 1983 buy because of the delay this would entail. In March 1983, the Army plans to definitize an existing letter contract for this procurement. The Army believes the risks of increasing production now are outweighed by the potential additional cost if production were held to nine fire units a year for another 2 years. Army officials estimate this additional cost at about \$250 million. These officials said they intend to award fixed-price contracts starting with fiscal year 1983 production.

GAO believes that delaying of the fiscal year 1983 contract for a few months would have minimal, if any, effect on the program's schedule and cost in view of the contractor's current inability to keep up with scheduled deliveries and the likelihood that it will be almost 1-1/2 years before the contractor draws even with the schedule. At the same time, a delay until production tests are concluded could provide the assurance, not yet at hand, that the Patriot will perform at or close to the level of Army requirements.

GAO made its review to determine the Army's progress in resolving Patriot's earlier performance and reliability problems in view of the bearing this could have on determining future production rates.